

CLAIMS

1. Modular HD (Heavy Duty) support system (1) having a strongly increased resistance to breaking strain and strain of flexure for the support of amongst others very huge and very heavy and complexly shaped shuttering , comprising:
 - 1.1. at least four stable vertical upright assembly systems (2) each consisting of:
 - 1.1.1. at least one tube-shaped upright element (2') consisting of a relatively heavily shape retaining tube profile which on its outer circumference and over all its length is provided with a plurality of C-shaped coupling members (6) which are positioned regularly on equally but differently distances along the outer circumference or in its longitudinal direction respectively;
 - 1.1.2. at least one relatively heavily tube-shaped coupling member (3) for mutually connecting two upright elements (2) positioned on top of each other into a compact compound element;
 - 1.1.3. at least a very heavy constructed adjustable spindle assembly (4) being mounted resistantly to tensile strain attached to the lower and/or upper side of an upright assembly (2), which spindle assembly (4) is provided with a coupling part (21) which is also provided with a plurality of C-shaped coupling members (6);
 - 1.2. at least four intermediate frames (5) for mutually interconnecting said stable vertical upright assembly systems (2), each intermediate frame (5) thereby consisting of:
 - 1.2.1. two mutually distantly spaced parallel horizontally positioned girders (43, 43') interconnected by means of lattice elements (44a, 44b) or the

like, whereby each of both free ends of a girder (43, 43') is provided with a,

- 1.2.2. coupling device (45, 45') which connects each of the four free ends of an intermediate frame (5) with an adjacent other vertical upright element (2') and/or spindle assembly thereby using said C-shaped coupling members (6),

in such a manner, that the modular HD support system (A) constructed from modular HD support systems (1) in its assembled position is transportable as a whole and adjustable in height respectively, which modular HD support system (1) can be introduced independently (as a single design) for support of usually smaller shuttering systems, and can also be used respectively, whereas in itself it may, also in height and in width be extended and moreover by practically an unlimited number of upright assembly systems (2) and intermediate frames (5).

2. Adjustable spindle assembly (4) according to claim 1, comprising:

- 2.1. a spindle (18) provided with a thread being capable of carrying a high load, which is provided at its upper end with guiding strips (23) serving for the inner concentric positioning and mounting of the spindle (18) respectively in the lower and/or upper end opening of a tube-shaped upright element (2'), which spindle (18) is provided at its bottom end with means (22, 25, 27, 28) for positioning and anchoring in,
- 2.2. a foot element (19) consisting of a foot plate (38) which at its upper part is provided with welded vertical reinforcement plates (40 a,b,c,d) and further is provided with means (42) for anchoring of the free end of the spindle (18),
- 2.3. a butterfly nut, mounted on the spindle (18), comprising a hollow cylindrical housing (29) internally provided with screw thread (30) while its bottom part is provided with a plurality of radially protruding handgrips (31) for the adjustment of the upright assembly (2) at the desired height and also, later on after hardening of the concrete, for fast dismantling by means of its rotation, and on its top side there has been mounted a free rotatable ring (32), which on its outside is provided with a set sheet

shaped screw holders (33) welded thereto for locking screws (24) for anchoring into the lower end opening of a tube-shaped upright element (2); in such a way, that the butterfly nut (20) resistant to tensile strain may be mounted to the lower and/or upper side of the upright element (2') without blocking the rotation of the butterfly nut (20),

- 2.4. a coupling piece (21) positioned on the spindle (18) and comprising a hollow cylindrical housing (35) internally provided with guiding strips (37) for its vertical guiding on the spindle (18), and further provided with four C-shaped coupling members (6) welded on the outer circumference welded in such a way that in its mounted position one or more intermediate frames (5) may be coupled up on the coupling parts (21) and also on the upright elements (2') thereby considerably reducing the free flexing length of the spindle (18),

in such a way, that the modular HD support system (1) in its assembled position on the building site may be adjusted in height and also may be subjected to a very high stress.

3. Coupling assembly for use in coupling of intermediate frames (5) on spindle assemblies (2) according to claim 1, comprising:

- 3.1. at least one coupling device (45, 45') comprising at least an upper claw (47) and a lower claw (48), each positioned on all four free ends of said intermediate frames (5); which upper claw (47) in a cross section is constructed as an L-shaped sheet element whereby the longest portion of the L is welded upon the free upper end of the horizontally positioned girders (43, 43') of an intermediate frame (5) and the shorter part of the L is pointing downward, whereby the lower claw (48) is formed as a loose L-shaped sheet element provided with a hollow cylindrical protrusion (50, 54b) being internally threaded and also guiding means (51) for positioning or centring respectively thereof whereby each lower claw (48) is fixed by means of a screw member (46) against the free lower side of the horizontally positioned girders (43, 43') of an intermediate frame (5), which

at a certain distance from their free end openings are each internally provided with a guiding tube element (49) for guiding the lower claw (48);

3.2. C-shaped coupling devices (6) according to claim 1, made from C-profile and respectively positioned on upright elements (2) and also coupling parts (21) of the spindle assemblies (4), whereby the inside of said C-profile offers sufficient space for locating therein of the specially shaped free end (45a) of upper claw (47) and also of the specially shaped free end (45b) of lower claw (48) for intercoupling of the intermediate frames (5) with the upright elements (2);

3.3. corner struts in an inclined position on two adjacent intermediate frames (5) near the free upper openings thereof by means of usual connecting means as e.g. a wedge coupling or the like,

in such a way that each of the four free end openings of an intermediate frame (5) may be connected into a very strong, stable and robust unit with an adjacent other vertical upright element (2') and/or spindle assembly (4), while preventing twisting of the HD support system module (1) in its assembled position.

4. Tube-shaped HD connecting member (3) for mutually coupling of two upright elements (2') one positioned upon the other according to claim 1, consisting of a tube profile provided with guiding means (13) for internal mounting into the upright elements (2') which is provided half way its length with a ring (10) having a greater outer diameter than the upright element (2) has, whereby both ends of the connecting member (3) are provided with pass-through openings (12b, 12c, 12e, 12f) for receiving a locking pin (8a, 8b) in a cross section in particular elliptical in such a way that the lower end of the locking member (3) is mounted from the upside down into an upright element (2') until the ring (10), whereafter on its upper end a next upright element (2') is located and locked respectively by means of locking pins (8a, 8b) each with an elliptical body (16) in cross section, which locking pins (8a, 8b) are each provided with a handgrip (14) which is positioned at a certain mutual distance by means of a perforated rectangular plate (11) welded on said ring (10), and whereby said mutual

distance corresponds to the mutual distance between the passing through openings (12a, 12b, 12c, 12d, 12e, 12f) on both ends of the connecting member (3) and the passing through openings (7, 7') of two upright elements (2') one positioned upon the other in mounted position; which locking pins (8a, 8b) are each provided with a round head rivet for securing the connection between the locking pin (8a, 8b) and with the connecting piece (3) and also with the vertical upright elements (2'); in such a way that an undesired release of both locking pins (8a, 8b) and their removal from the sheet shaped pin holder (11) will not be possible during the disassembly of the intended construction and/or other operations as e.g. its transportation thereof.

5. Tube-shaped upright element (2') according to one or more of the preceding claims, characterized by its construction in steel of standard lengths of 1200 mm, 1800 mm, 2400, 3000 mm having an outer diameter of approx. 135 mm and having of a wall thickness of approx. 6mm and being loadable till approx. 250 kN.
6. Coupling assembly according to one or more of the preceding claims, characterized in that the C-shaped coupling means (6) from steel C-profile having a length of approx. 50 mm and a thickness of approx. 10 mm; whereby the upper and lower edge of the C-shaped coupling means (6) are reinforced (increased thickness) with respect to its solidity and durability.
7. Coupling assembly according to one or more preceding claims, whereby the downwardly pointing short part of the L (45a) of the upper claw 47 of a coupling device (45) which is positioned on the upper girder (43) of an intermediate frame (5) is 10 mm longer than the downwardly pointing short part of the L (45a) of the upper claw (47) of a coupling device (45') which is positioned on the lower girder (43') of an intermediate frame (5).

8. Screw member (46) according to claim 3, characterized in that the oblong screw body (57) having a length of approx. 200 mm and a pitch of 10 mm is provided on its upper side with a butterfly nut (56) for screwing on manually or by means of a suitable tool.
9. Connecting frames (5) in lattice design, according to one or more of the preceding claims, characterized by, producing said frames are manufactured in standard lengths of 1200 mm, 1800 mm, 2400, 3000 mm.
10. Adjustable spindle assembly (4) according to one or more of the preceding claims, characterized in that, the outer diameter of the spindle (18) being 100 mm by a length of the spindle of approx. 1200 mm, approx. $\frac{3}{4}$ of the total length is provided with quadratic or trapezoid threading (26), with a pitch of approx. 25 mm, capable of taking high loads.
11. Adjustable spindle assembly (4) according to one or more of the preceding claims, characterized in that the means for positioning and anchoring of the spindle (18) in the foot element (19) comprise a solid locking pin (2) having an outer diameter of approx. 40 mm and a length of 180 mm, and further comprise a tube element (25) for internally reinforcing of the bottom side of the spindle (18), whereby said solid locking pin (22), passing through a borehole (28) having a diameter of 40 mm, is mounted at a distance of approx. 80 mm with respect to the centre of the free bottom end opening of said spindle (18) and further through a borehole (42) positioned at a distance of approx. 70 mm with respect to the centre of the free upper end opening of said foot element (19), whereby the outwardly extending end of the locking pin (22) is locked by means of a usual locking clip.
12. Adjustable spindle assembly (4) according to one or more of the preceding claims, characterized in that the foot element (19) comprises a square shaped

steel plate (38) with a thickness of approx. 15 mm and having a side length of approx. 300 mm having two symmetrical positioned vertical walls (39) welded thereon each having a thickness of approx. 15 mm, each side wall (39) comprises a rectangular central part (40a), provided with a reinforcement plate (41) welded thereupon having a borehole (42) and moreover, located on both sides of the rectangular central part (40a) of the wall (39) and under an angle of approx. 135° inclined downwardly cut or bent respectively left part (40c) and right part (40b).